

Art Rejections

Before turning to the Examiner's rejections under 35 U.S.C. §103(a), it may be helpful to briefly review the substance of Applicants' invention. Applicants' claimed invention is directed to environmentally degradable melt spun fibers comprising a polyhydroxyalkanoate copolymer (PHA) and a polylactic acid polymer or copolymer (PLA). Such compositions, either as blends or different components, generally provide material properties different and improved in any one or more properties as compared to PHA copolymers alone or to PLA polymers or copolymers alone. Properties in which the blended materials are different and improved are any one of hardness/softness, brittleness/flexibility, tack, i.e., stickiness, toughness, ductility, processability, or opaqueness/transparency, for example. A preferred configuration of the present invention is directed to biodegradable fibers comprising a sheath/core structure where the core comprises a biodegradable polyhydroxyalkanoate copolymer and the sheath comprises a PLA polymer or copolymer. Nonwoven webs and disposable articles comprising the environmentally degradable fibers are also disclosed.

Claims 1-20 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Wnuk '467 alone or in view of Noda '590, '116 and '470. Applicants respectfully submit that in light of the following arguments, the above identified references would not have led one skilled in the art to the invention as set forth in Claims 1-20.

The Examiner states that Wnuk '467 teaches compositions comprising polyhydroxyalkanoate (PHA) and polylactide (PLA) that can be used to form biodegradable fibers that are useful in forming nonwoven articles. However, Wnuk '467 does not teach or suggest the use of the specific PHA copolymers recited in Claim 1. Importantly, Applicants have discovered that the newer type of PHAs claimed in the present invention have superior properties compared to the conventional PHAs disclosed in the Wnuk reference. In particular the PHAs claimed herein can be melt processed at much lower temperatures than that of conventional PHAs and thus are less susceptible to thermal degradation during processing. Furthermore, the resulting fibers have improved mechanical properties as they are less crystalline and thus less brittle than conventional PHAs such as polyhydroxybutyrate (PHB) and polyhydroxybutyrate/valerate (PHBV).

Next, the Examiner states that each of Noda '590 '116 and '470 teaches copolymers of polyhydroxybutyrate that are easily melt processed and can be used to make fibers. Applicants acknowledge that Noda '590, '116 and/or '470 all disclose PHAs similar to those claimed herein. However, there is nothing in any of the Noda references teaching or suggesting combining these

PHA copolymers with a polylactic acid polymer or copolymer. Importantly, Applicants have discovered that while the mechanical properties and melt handling conditions of the PHA copolymers described in Noda '590, '116 and/or '470 are generally improved over that of conventional PHAs such as PHB or PHBV, their rate of crystallization is characteristically slow.

In fact, it has been a considerable challenge to convert these newer PHA copolymers into useful forms by conventional melt methods, for they remain substantially tacky after they are cooled down from the melt, and remain as such until sufficient crystallinity sets in. Residual tack typically can lead to material sticking to itself or to the processing equipment, or both, and thereby can restrict the speed at which a polymeric product is produced or prevent the product from being collected in a form of suitable quality. Importantly, Applicants have discovered that combining these newer PHA copolymers with a polylactic acid polymer or copolymer can greatly improve the properties as compared to PHA copolymers alone. In particular, the use of the second PLA polymer will make the polymer blend more spinnable and help to prevent stickiness that is commonly associated with the newer PHA copolymers.

Furthermore, it is respectfully submitted that the Examiner is relying on impermissible hindsight gained from having the benefit of reading Applicants' own specification in order to combine the Wnuk and Noda references to reject Claims 1-20 of Applicants' invention. The Wnuk reference is not concerned with the processing difficulty of these newer PHA copolymers as they are not even disclosed therein. Whereas, the Noda references are not directed to blends of PHAs with other biodegradable polymers, but rather to PHA compositions per se. It is well-settled that when prior art references require a selective combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself.

Based on the foregoing, Applicants respectfully submit that Claims 1--20 are not obvious over Wnuk '467 alone or in view of Noda '590, '116 and '470 and respectfully request that the Examiner's rejection under 35 U.S.C. § 103(a) be withdrawn.

Next, Claims 1-16 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Matsui '602. Applicants respectfully submit that in light of the following arguments, the above identified reference would not have led one skilled in the art to the invention as set forth in Claims 1-16.

The Examiner states that the Matsui reference teaches degradable fiber comprising a high melting aliphatic polyester that can be polylactic acid and a low melting polyester that can be a copolymer of butyric and/or valeric acid and a lactone such as caprolactone or butyrolactone. However, the Matsui reference does not teach or suggest the use of the PHA copolymers recited in Claim 1 of Applicants' invention. In fact, the Matsui reference does not even mention the use of conventional polyhydroxyalkanoate polymers such as PHB or PHBV. Thus, it can hardly be said on any objective basis that the Matsui reference, which does not even relate to fibers comprising PHAs, can somehow render obvious Applicants' invention which requires the use of specific PHA copolymers in its degradable melt spun compositions.

Based on the foregoing, Applicants respectfully submit that Claims 1--16 are not obvious over Matsui '602 and respectfully request that the Examiner's rejection under 35 U.S.C. § 103(a) be withdrawn.

Conclusion

In light of the above foregoing remarks, Applicants believe that Claims 1-20 are now in form for allowance. Accordingly, it is respectfully requested that the claims be reconsidered, the rejections under 35 U.S.C. §103(a) be withdrawn, and the claims be allowed. Should the Examiner have any questions or wish to further discuss this matter, it is requested that the undersigned attorney be contacted at (513) 634-9135.

Respectfully submitted,

By Bart S. Hersko

Bart S. Hersko
Attorney for Applicants
Registration No. 32,572
(513) 634-9135

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